NEW SOUTH WALES
DEPARTMENT OF AGRICULTURE

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# CONTRIBUTIONS
FROM THE
# NEW SOUTH WALES
# NATIONAL HERBARIUM

*Flora Series: Nos. 27-28* **1966**

G 11499

# CONSPECTUS OF FAMILIES OF VASCULAR PLANTS REPRESENTED IN THE FLORA OF NEW SOUTH WALES

(The account of each family, or consecutive group of families as issued, will appear with separate pagination; the names of those families that have been published to date are in italics.)

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2 *Podocarpaceae*
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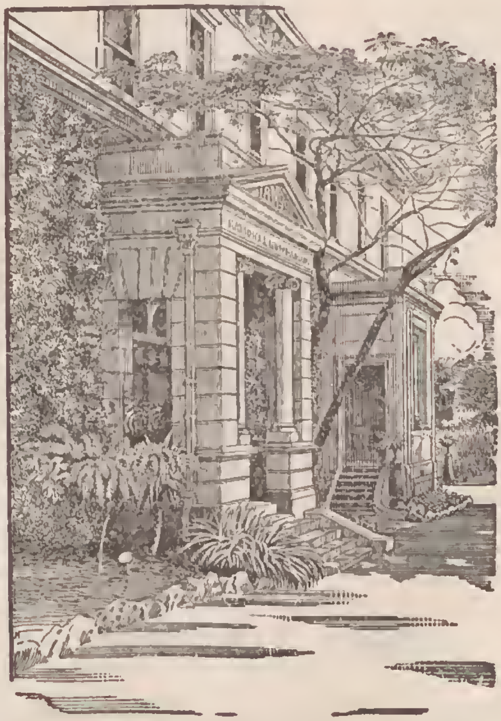

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# FLORA OF NEW SOUTH WALES

by

VARIOUS BOTANISTS

Produced under the Direction of

K. MAIR

Director and Chief Botanist,
National Herbarium of New South Wales

No. 27 XYRIDACEAE
No. 28 ERIOCAULACEAE

EDITOR: JOYCE W. VICKERY

Formerly produced under the direction of R. H. Anderson, 1961-1964

# 27. XYRIDACEAE

(By O. D. Evans)

Flowers bisexual, actinomorphic except for the calyces. Calyx of 3 or 2 sepals. Corolla often gamopetalous, with a slender, short or long tube and 3 equal spreading lobes, or of 3 petals. Stamens 3, opposite the corolla lobes, and often attached to them, the outer whorl absent or represented by 3 simple or penicillate staminodes alternating with the corolla lobes. Anthers 2-locular, opening by longitudinal slits; pollen grains spinose or espinose. Ovary superior, sessile, either 1-locular with 3 parietal placentas or 3-locular with axile placentation, or imperfectly 3-locular and the placentas then arising from the base of the ovary and either more or less confluent or incompletely axile; ovules anatropous, few to numerous; style 1, simple or 3-lobed. Fruit a capsule, often enclosed in the withered but persistent corolla-tube and usually opening loculicidally into 3 valves. Seeds ovoid to oblong-fusiform, usually striate. Embryo erect, extending beyond the copious endosperm at the end remote from the hilum.

Perennial or rarely annual herbs with fibrous roots. Stems short or rarely elongate. Leaves basal and distichous or rosulate, closely crowded, rarely cauline, linear or terete, often ensiform, sometimes twisted. Flowers few to many in a terminal bracteate head or short dense spike (rarely in an open inflorescence); peduncles often scape-like.

A family of 4 genera with more than 270 species, mostly plants of marshy or frequently inundated conditions in tropical, sub-tropical and sometimes temperate regions. All confined to America except the largest genus *Xyris*.

## XYRIS L.

Perennial or rarely annual, tufted, scapigerous herbs with fibrous roots. Leaves all basal, distichous, linear or terete, ensiform, often twisted, usually with enlarged, open sheathing bases. Flowers solitary and sessile in the axils of broad, rigid, coriaceous, imbricate bracts, few to many, forming a dense head or short spike, terminal on a leafless, rigid, terete or compressed scape, the outer bracts of the head or spike barren; base of the scape enclosed in a sheath which may bear a vestigial lamina. Calyx zygomorphic, the 2 outer sepals lateral, glumaceous, bract-like, persistent, often keeled, conduplicate, the inner sepal larger, membranous, completely enclosing the corolla in bud, cast off as the flower opens. Corolla yellow (in Australian species), white or blue, gamopetalous, 3-lobed, membranous and soon withering. Pollen grains espinose. Staminodes conspicuous and densely penicillate (in N.S.W. species) with moniliform hairs. Style more or less deeply 3-lobed, rarely undivided. Ovary, fruit and seeds as for the family.

A genus of more than 250 species in the tropical and subtropical regions of the Americas, Africa, Asia and Australia, with a few species in temperate regions. About 19 species are found in Australia, all but 2 of them endemic; 5 species occur in New South Wales.

Malme in Engler, Pflanzenfam. ed. 2, 15a (1930) 35–38, recognises three sections in the genus, distinguished by the characters of the ovary and fruit. One section, *Pomatoxyris*, is confined to Australia and includes *X. operculata*, *X. ustulata* and *X. gracilis*; the section *Xyris* is world-wide and includes *X. complanata* and *X. juncea;* the third section is confined to America. However, as pointed out by Briggs (Contrib. N.S.W. Nat. Herb. IV (1966) 26, 29), all the N.S.W. species have the same basic chromosome number, $x = 13$, whereas the numbers recorded for American and Asiatic species of Section *Xyris* are $x = 9$ and $x = 17$. As our species do fall into two groups on the basis of the placentation and seed form, further investigation of sectional limits and chromosome numbers throughout the genus is desirable.

All measurements of flower-heads in the following key exclude corollas.

1. Leaves terete, subulate or somewhat flattened, always without differentiated margins, smooth when fresh, ribbed, striate or rarely smooth when dry. Ovary and fruit often thickened at the apex.

  2. Flower-heads 0·8–2·0 cm. long, 0·5–1·5 cm. diam. Leaves 20–100 cm. long. Ovary and fruit thickened at the apex.

    3. Lower bracts in the flower-heads more or less distinctly 5-ranked and more or less closely imbricate. Flower-heads gradually tapering below towards the peduncle. Apex of the ovary and fruit 3-lobed; style base seated in the depression between the lobes ...... *X. operculata* 1.

    3.* Lower bracts not distinctly 5-ranked, often spreading or reflexed. Flower-heads rounded at the base, not tapering to the peduncle. Apex of the ovary and fruit not distinctly 3-lobed, obtuse, crowned with the persistent base of the style ..................... *X. ustulata* 2.

  2.* Flower-heads 0·4–0·8 cm. long, 0·4–0·8 cm. diam.; leaves 2–15 cm. long. Apex of the ovary not differentiated ............................ *X. juncea* 5.

1.* Leaves flat, narrow-linear to linear, 2–30 cm. long or rarely longer, 0·5–5·0 mm. wide, with paler, silicified, often scabridulous margins. Apex of the ovary and fruit not differentiated.

  4. Lateral sepals not or slightly keeled, the membranous margins narrow and entire, the apices not ciliolate. Style cleft for half its length, its branches linear. Fertile bracts often with a paler median area. Seeds fusiform. ........................................................ *X. gracilis* 3.

  4.* Lateral sepals keeled, the membranous margins wide, the apices ciliolate. Style branches short, broad. Bracts mostly uniform in colour. Seeds ovoid to ellipsoid.

    5. Scape flattened, 20–60 cm. long. Flower-heads ovoid, oblong-ovoid or cylindrical, 1–2·5 cm. long ......................... *X. complanata* 4.

    5.* Scape filiform, terete or obtusely angular, 7–30 cm. long. Flower heads more or less globose at maturity, 0·4–0·8 cm. long. ...... *X. juncea* 5.

**1. X. operculata** *Labill.*, Nov. Holl. Pl. Spec. 1 (1804) 14, t. 10; Curtis Bot. Mag. XXVIII (1808) t. 1158; R. Br., Prodr. (1810) 257; Lodd. Bot. Cab. III (1818) t. 205; Endl., Iconogr. Gen. Plant. (1837) t. 13; Kunth, Enum. Pl. IV (1843) 22; Schnizlein, Icon. Fam. Nat. Reg. Veg. I (1845) t. 47, figs. 3-9; Lindl., Veg. Kingd. ed. 2 (1848) 187, fig. 128; Hook. f., Fl. Tas. II (1857) 69; F. Muell., Fragm. Phytogr. Austral. VIII (1874) 205; Benth., Fl. Austral. VII (1878) 79, excl. var. *bracteata* and var. *macrocephala*; F. M. Bail., Synops. Qld. Fl. (1883) 554; Nilss. in K. Svensk Vet.-Akad. Handl. n.s. XXIV, No. 14 (1891) 26; Moore & Betche, Handb. Fl. N.S.W. (1893) 437; F. M. Bail., Qld. Fl. V (1902) 1649; Rodway, Tas. Fl. (1903) 220; F. M. Bail., Compr. Cat. Qld. Pl. (1909) 561; Domin in Bibl. Bot. XX (1915)

506; Maiden & Betche, Census N.S.W. Pl. (1916) 38; Black, Fl. S. Austral. ed. 2, I (1943) 79; Malme in Svensk Bot.Tidskr. XXI (1927) 381–386; Williamson in Vic. Nat. XLV (1928) 160, 162, fig. 1; Malme in Engl. & Prantl., Nat. Pflanzenf. ed. 2, 15a (1930) 37, fig. 12d; Ewart, Fl. Vic. (1931) 262; J. H. Willis, Handb. Pl. Vic. 1 (1962) 280; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963) 432. Perennial. Leaves rigid, more or less terete, ribbed or striate, acuminate, glabrous, 20–60 cm. long, up to 1 mm. wide; sheathing bases shining brown, 5–15 cm. long. Scapes 30–100 cm. long, 1–1·5 mm. diam., terete, glabrous, smooth, sometimes twisted. Flower-heads obovoid or rarely globose, 1–1·5 cm. long, 0·5–1 cm. wide, very often gradually tapered below to meet the peduncle, rarely obtuse at the base. Barren bracts usually rather numerous, more or less in 5 vertical ranks, progressively smaller towards the base of the head, the basal pair rarely exceeding 2 mm. long, median fertile bracts usually broad and rounded, dark-bordered, the margins entire, fringed, denticulate or (rarely) lacerate. Lateral sepals with a distinct, often fringed or ciliolate keel, rather wide membranous margins and an often ciliolate apex. Corolla-lobes broadly obovate, ca. 8 mm. long when dry. Stamens: anthers narrow-oblong, ca. 2·5 mm. long; filaments shorter. Style filiform, cleft in the upper part into 3 short capitate branches. Ovary turbinate, incompletely 3-locular, the apex enlarged, thickened and later hardened, 3-lobed, with the persistent base of the style seated in the depression between the lobes. Capsule 3–4 mm. long, 2·5–3 mm. wide, turbinate, brown, the lower portion thin-walled in strong contrast to the apical region; placentas at this stage basal, free-central, coherent below, distinct above and extending nearly the full length of the fruit; dehiscence loculicidal below, the hardened apex remaining undivided and sometimes cast off like an operculum. Seeds more or less fusiform, erect, striate, brown, ca. 1·25 mm. long. Chromosome number: $2n = 26$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). Fl. Summer. *X. brownii* Kunth, Enum. Pl. IV (1843) 22; (as "*brownei*") Nilss., loc. cit.

Coast and eastern parts of the Tablelands, in sedge swamps on sandstone and acid granite, in deep sandy soils at the margin of coastal swamps and in wet ground in open sandy heath. Wardell, Constable 10.1961 (63268); 1 mile W of Broadwater Beach, Green & Williams 10.1962 (NE); 1 mile W of Evans Head, Green & Williams 10.1962 (NE); near Angourie Beach, Green & Williams 11.1962 (NE); Gibraltar Range, 45 miles NE of Glen Innes, Jessup & Gray, 12.1953 (41943); Gibraltar State Forest, 40 miles from Glen Innes, Williams & Winterhalter 10.1958 (58339); Corindi to Red Rock road, ca. 20 miles N of Coff's Harbour, Constable 10.1961 (63095); Coff's Harbour, Floyd 9.1959 (58332); Coff's Harbour Airport, Green & Williams 10.1962 (NE); Coff's Harbour Airport, Constable 5.1964 (69634); near turn off to Point Lookout, on Armidale to Ebor road, St. John 12.1950 (18390); Bullock Creek, on Armidale to Ebor road, Green 11.1960 (NE); ½ mile along Point Lookout road from Ebor road, Ford 1.1958 (58340); Port Macquarie, Boorman 11.1915 (18370); Booti Booti, Johnson 10.1953 (26220); Tea Gardens, Lord 10.1951 (18364); S of Nelson Bay on Stockton road, Evans 12.1961 (63131); Somersby, Cross 10.1945 (18365); Kariong, Chippendale 11.1953 (58333); Cowan to Jerusalem Bay, Salasoo No. 1249, 11.1954 (30941); near Dee Why Lagoon, Briggs 9.1961 (59892); Manly, Fletcher 10.1890 (18367); Port Jackson (18366); Centennial Park, Forsyth 10.1896 (18368); Alexandria Swamps, Fletcher 10.1888 (20451); near Long Bay Gaol, Evans 12.1932 (SYD); La Perouse, Botany Bay, Camfield 10.1897 (18369); Cape Solander, Johnson 10.1945 (15592); Loftus, Constable 7.1963 (66915); near junction of Darke's Forest road and Prince's Highway, Constable 7.1963 (66916), 5.1964 (68723); near Sublime Point, Constable 7.1963 (66917); junction of Prince's Highway and Appin road near Bulli Pass, Constable 2.1964 (69637), 7.1963 (66918), 5.1964 (69633); Edina Falls, Hill Top, Evans 1.1963 (63130); The Barren Ground, E of Robertson, Briggs 12.1963 (67510); Barrengarry Pass, Rodway 12.1922 (58337); Pt. Perpendicular, Jervis Bay, Rodway 12.1916 (58336); Jervis Bay, Rodway No. 560, 10.1931 (58335); Mt. Currockbilly, near Braidwood, Boorman 3.1908 (18389); Mt. Naghi, Naghi State Forest, Constable 8.1963 (64358). Also in southern Queensland, Victoria, southern parts of South Australia and Tasmania.

It is curious that the species has not been collected on the Blue Mountains, although it occurs in similar wet tableland habitats both to the north and to the south.

In the illustrations appearing in F. Muell., Key Syst. Vic. Pl. II (1886) fig. 122, and in Ewart, Pl. Indig. Vic. II (1910) 34, t. 97, under the name of *X. gracilis*, the inflorescences and flowers depicted are *X. operculata*.

**2. X. ustulata** *Nilss.* in K. Svensk. Vet.-Akad. Handl. n.s. XXIV, No. 14 (1891) 28; Rendle in Journ. Bot. XXXVII (1899) 504; Maiden & Betche, Census N.S.W. Pl. (1916) 38; Malme in Svensk Bot. Tidskr. XXI (1927) 381–389; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963) 432. Perennial. Leaves rigid, more or less terete, acuminate, glabrous, smooth when fresh, wrinkled when dry, 50–100 cm. long, up to 1 mm. wide; sheathing bases 8–12 cm. long, dark red-brown to black, shining. Scapes terete or obtusely angular, glabrous, smooth, 60–150 cm. long, up to 2 mm. diam. Flower-heads globose to subglobose, obtuse at the base, 0·8–1·5 cm. long, 0·9–1·5 cm. wide. Barren bracts numerous, loosely imbricate to reflexed, not in vertical ranks, the lowest two ca. 2 mm. long; median fertile bracts elliptical to obovate, the apex expanded and reflexed, the margins black and lacerated, the centres dark brown. Lateral sepals oblong, ca. 5 mm. long, keeled and winged, the upper portion of each wing expanded, with denticulate or lacerate margins. Corolla-lobes obovate, 7–10 mm. long when dry. Stamens: anthers ca. 1·5 mm. long, as broad as long; filaments short. Style filiform, divided in the upper part into 3 short branches with slightly enlarged stigmatic ends. Ovary obovoid, somewhat flattened, incompletely 3-locular, the apex thickened, obtuse, sometimes slightly 3-lobed, crowned with the base of the style. Capsule obovoid to ellipsoid, slightly triquetrous, nearly black, 4–5 mm. long, 2·5–3 mm. wide, the apex as in the ovary; placentas at this stage basal, free-central, coherent below, distinct above, extending nearly the full length of the fruit; dehiscence loculicidal into 3 valves, splitting from the base upward to the margin of the thickened region of the apex. Seeds more or less fusiform, erect, striate, very dark brown, 1·25–1.5 mm. long, up to 0·5 mm. wide. Chromosome number: $2n = 26$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). Fl. Summer. *X. operculata* Labill. var. *macrocephala* Benth., Fl. Austral. VII (1878) 80.

Central Tablelands and the highlands of the Central Coast. In swampy ground on sandstone and also sometimes in *Sphagnum* bogs. Mt. Victor road, ½ mile from Running Stream, Capertee district, Constable 5.1963 (64360); Bell, Hamilton 9.1914 (18356); Tesselated Hill, near Mt. Irvine, Constable 4.1963 (63221); Mt. Wilson, Gregson 12.1897 (18360); Pearce's Pass, off Bell's Line road, Constable 4.1963 (63120), 8.1963 (66925); Mt. Charles, Constable 4.1963 (63243); Mt. Tomah, Maiden 1.1898 (18359); Mt. Tomah South, Ingram 9.1962 (63266); Perry's Lookdown, Blackheath, Constable 12.1961 (55707); Govett's Leap, Blackheath, Briggs 10.1953 (NE); Blackheath, Maiden 1.1905 (20450); Rodriguez Pass, Blackheath, Johnson 12.1951 (20449); Blackheath, Constable 11.1963 (66547); Katoomba, Camfield 12.1908 (18363); Katoomba, Dixon 12.1903 (20448); Minnehaha Falls, Katoomba, Evans 11.1961 (63143); Leura, Hamilton 9.1914 (18358); Leura, Cropper 12.1949 (18361); Wentworth Falls, Deane 11.1884 (18354); Wentworth Falls, Evans 12.1926 (SYD); Woodford, Hamilton 1.1915 (18357); Bull's Camp, Woodford, Constable 7.1963 (66133); Linden, Constable 11.1959 (55975), 4.1963 (63122); Berambing Park, Bilpin, Hungerford 11.1962 (63265); behind Panorama Point, Bulli Pass, Holloway 11.1936 (18355); near top of Bulli Pass, McLuckie 10.1940 (SYD); Edina Falls, near Hill Top, Evans 1.1963 (63222); Fitzroy Falls, Rodway No. 241, 11.1930 (58330); at margin of Barren Grounds Reserve, Constable 7.1964 (65369).

**3. X. gracilis** *R. Br.*, Prodr. Fl. Nov. Holl. (1810) 256; Kunth, Enum. Pl. IV (1843) 21; Hook. f., Fl. Tas. II (1857) 69, excl. Tasmanian specimens; F. Muell., Fragm. Phytogr. Austral. VIII (1874) 204, excl. Tasmanian specimens; Benth., Fl. Austral. VII (1878) 79, excl. var. *bracteata* and syn. *X. juncea*; Nilss. in K. Svensk Vet.-Akad. Handl. n.s. XXIV, No. 14 (1891) 26, excl. var. *bracteata*; Moore & Betche, Handb. Fl. N.S.W. (1893) 437; Rendle in Journ. Bot. XXXVII (1899) 501; F. M. Bail., Qld. Fl. V (1902) 1649, excl. syn. *X. juncea*; Rodway, Tas. Fl. (1903) 220 excl. var. *bracteata* and Tasmanian material; Maiden & Betche, Census N.S.W. Pl. (1916) 38, excl. var. *bracteata*; Arber in Bot. Gaz. LXXIV (1922) 83, pl. II, fig. 17; Malme in Svensk Bot. Tidskr. XXI (1927) 381–399; Williamson in Vic. Nat. XLV (1928) 160, excl. fig.; Ewart, Fl. Vic. (1931) 262; J. H. Willis, Handb. Pl. Vic. (1962) 280; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963)

432. † See footnote. Further references will be found under the synonymy of ssp. *laxa.* Perennial. Leaves linear, flat, 3–30 cm. long, 1–5 mm. wide, erect, rigid, striate, acuminate, with pale scabrous margins, often twisted; sheathing bases 2–5 cm. long, light to dark brown, dull or shining. Scapes 20–100 cm. long, 0·5–2 mm. diam., terete, striate, or slightly angular, glabrous. Flower-heads from ovoid or obovoid to oblong-elliptical or subglobose, 0·6–1·0 cm. long, 0·3–0·8 cm. diam. (exclusive of corollas or elongated bracts). Barren bracts not in vertical ranks, oblong to linear, 2–12 mm. long, appressed or lax. Median fertile bracts greenish- or greyish-brown with dark, usually entire margins. Lateral sepals 5–8 mm. long, not or only slightly keeled, the membranous margins narrow and entire, the apices obtuse, not ciliolate. Corolla lobes ca. 7 mm. long when dry. Stamens: anthers 1·5–2·5 mm. long; filaments slightly shorter. Style filiform, cleft for half its length into 3 linear branches. Ovary oblong to narrow-obovate, compressed, incompletely 3-locular. Capsule oblong-ellipsoid, somewhat compressed, unevenly triquetrous, incompletely 3-locular, 4–5 mm. long, 2–3 mm. wide, brown; apex obtuse, not thickened or differentiated, crowned with the persistent base of the style; dehiscence loculicidal from base to apex. Seeds brown, more or less fusiform, erect, striate, 1–1·5 mm. long. Fl. Nov.–Mar. For synonymy see under ssp. *laxa.*

In this species two subspecies may be recognised, although in a considerable portion of the area the populations are intermediate. For a detailed discussion see Evans in Contrib. N.S.W. Nat. Herb. IV (1966) 4–7. In the area from Botany Bay to Jervis Bay both subspecies occur and are apparently quite distinct. North of Port Jackson and on the lower Blue Mountains the intermediates are abundant. In other parts of the range ssp. *gracilis* alone seems to occur.

1. Leaves narrow-linear, not exceeding 2 mm. wide. Flower-heads ovoid to ellipsoid; bracts 6–14, all closely appressed, the two at the base of the head not exceeding 3 mm. long. Flowers 1–4 in the head .................................... ssp. *gracilis* a.

1.* Leaves linear, 2–5 mm. wide. Flower heads subglobose; bracts 18–28, the two at the base 3–13 mm. long, lax. Flowers mostly 8–12 in the head.......... ssp. *laxa* b.

The above key applies to typical representatives of the two subspecies; as pointed out above, intermediate plants will often be found showing different associations of characters.

a. ssp. **gracilis**. Leaves narrow-linear, 1–1·5 (–2) mm. wide, erect, rigid, often twisted. Peduncles terete, up to 60 cm. long, 0·5–1 mm. diam. Flower-heads ovoid to ellipsoid, 6–8 mm. long, 3–5 mm. diam.; bracts 6–14, the basal ones closely appressed, the lowest pair 2–3 mm. long. Flowers 1–4 in the head. Lateral sepals not exceeding 6 mm. long. Anthers 1·5–2 mm. long. Seeds ca. 1 mm. long. Chromosome number: $2n = 26$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). Fl. Summer.

Coast, Northern, Central and Southern Tablelands, in sedge swamps on sandstone and similar rocks, in deep sandy soils near the margins of coastal swamps and in damp soil in sandy heath. Boonoo Boonoo via Tenterfield, Knoetzsh 1.1885 (MEL); Timbarra, Stuart (?) (MEL); Wardell, Constable 10.1961 (63267); S of Broadwater, Constable 5.1964 (64570); 1 mile W of Angourie, Green & Williams 11.1962 (NE); Coff's Harbour Airport, Green & Williams 10.1962 (NE); Coff's Harbour Airport, Constable 5.1954 (69451); 2 miles SW of Lemon Tree Passage, Port Stephens, Johnson 4.1964 (69230); S of Nelson Bay on Stockton road, Evans 12.1961 (63140); Newcastle Racecourse, Cambage No. 608, 11.1901 (18334; SYD); Clarence, Boorman 1.1901 (18331); Clarence, Constable 7.1963 (66134); Newnes Junction to Eskbank, Hamilton 11.1914 (18336); below Newnes Junction Station, Constable 6.1963 (66135); Bell,

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† The various authors cited differ in their circumscription of *X. gracilis*; some include plants referable to ssp. *laxa* while others interpret the species in the narrower sense.

Constable 6.1964 (64604); near Mt. Irvine, Constable 4.1963 (63235); Mt. Victoria, Maiden 12.1896 (18333); Mt. Boyce, Blackheath, Constable 12.1963 (63142); Blackheath, Evans 1.1928 (SYD); Blackheath, Constable 11.1963 (66546); Katoomba, Camfield 12.1908 (18328); The Lake, Wentworth Falls, Constable 1.1964 (64016); Wentworth Falls, Burgess 1.1956 (35822); King's Tableland, Wentworth Falls, Hamilton 1.1915 (18339); Tesselate Hill, Mt. Irvine, Constable 4.1963 (63242); Bowen's Creek road, Bilpin, Constable 4.1963 (63235); Cowan, Evans 12.1963 (64314); Peat's road, Hornsby to Hawkesbury R., Deane 12.1884 (18327); Randwick, Betche 11.1881 (18335); near Long Bay Gaol, Evans 11.1932 (SYD); near La Perouse, Botany Bay, Evans 12.1925 (SYD), 12.1929 (SYD); Botany Bay, Mueller (MEL); S of Waterfall, on Prince's Highway, Evans & Constable 5.1964 (68719, 69453); junction of Prince's Highway and Darke's Forest road, Constable 2.1964 (64574); junction of Prince's Highway and Appin road, Constable 7.1963 (66918); near Bulli Lookout, Evans & Constable 5.1964 (68718); Thirlmere to Buxton, Evans 12.1962 (66926); Kanangra Walls, Sydney University Biological Soc. 4.1959 (SYD); Hill Top, Picton to Mittagong, Cheel 11.1911 (18337); Hill Top, Evans 1.1963 (63141); Mittagong, Dixon (18338); Upper Kangaroo R., SE of Robertson, Rodway 1.1943 (58323); Wingello, Boorman 12.1899 (18332); Barber's Creek, Tallong, Rumsey 3.1899 (18340); Bowen Is. Jervis Bay, Rodway 12.1925 (58324); Sassafras, Hadley, ex Herb. Rodway No. 3058, 1.1940 (58325); White Rock R., near Rockton, Constable 8.1963 (64357); Green Cape, Rodway 12.1920 (58326); Mt. Naghi, Naghi State Forest, Constable 8.1963 (64359); Genoa [R.] district, Bäuerlen 2.1885 (MEL). Also in Victoria, and to be expected in southern Queensland.

b. ssp. **laxa** *O. Evans* in Contrib. N.S.W. Nat. Herb. IV (1966) 5. Leaves linear, flat, acuminate, 2–5 mm. wide, the margins scabridulous. Peduncles terete or slightly angular, 1–2 mm. diam. Flower-heads subglobose, ca. 10 mm. long, 7–8 mm. diam. (omitting corollas and long bracts); bracts 18–28, the basal ones lax, scarious, the lowest two 3–13 mm. long, oblong to linear, often conspicuous. Flowers 8–12 in the head. Lateral sepals 6–8 mm. long. Anthers 2–2·5 mm. long. Seeds 1–1·5 mm. long. Chromosome number: $2n = 26$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). Fl. Summer. *X. bracteata* R. Br., Prodr. (1810) 256; Kunth, Enum. Pl. IV (1843) 21; Rendle in Journ. Bot. XXXVII (1899) 503; Malme in Svensk Bot. Tridskr. XXI (1927) 384. *X. operculata* Labill. var. *bracteata* (R. Br.) Benth., Fl. Austral. VII (1878) 80. Non *X. gracilis* R. Br. var. *bracteata* Benth., loc. cit., 79.

Central Coast and northern part of the South Coast, in damp soil, commonly in heathland, Mt. Colah, Salasoo No. 1512, 1.1957 (58322); Manly, Siegert 12.1884 (MEL); Mosman, Chapman 11.1906 (SYD); Kogarah, Camfield 11.1896 (18343); Kurnell, Constable 12.1962 (66058); Loftus, Camfield 1896 (18346); Loftus, Constable 7.1963 (66920); Loftus, Evans & Constable 5.1964 (68716); Port Hacking, Hamilton 1.1909 (18344); Bundeena, Green 11.1960 (NE); 1 mile NW of Marley Beach, Briggs 12.1961 (57708) HOLOTYPE; near Flat Rock, Royal National Park, Constable 2.1964 (64568); Waterfall, Camfield 1.1899 (18342); Prince's Highway, S of Waterfall, Evans & Constable 5.1964 (64569); Stanwell Park to Otford, Salasoo No. 1282, 12.1954 (30940); N of Sublime Pt., W of Austinmer, Constable 7.1963 (66919); Bulli, near junction of Prince's Highway and Appin road, Evans & Constable 5.1964 (68717); Barren Grounds Reserve, Whalley 1964 (72386); Currarong, N of Jervis Bay, Briggs 12.1963 (64378); Long Beach, Jervis Bay, Briggs 12.1963 (64405); Sieber No. 427, Fl. Nov. Holl. (MEL); Brown, Iter Austral. 1802–5, 2 sheets (MEL).

The subspecies is not confined to the same conditions as ssp. *gracilis*; it extends to moist soils in heath and even to open sclerophyll woodland. At Loftus it grows in a shallow rocky soil which is liable to local flooding.

The intermediate forms are mostly characterised by the wider leaves of ssp. *laxa* but the number of flowers and bracts in the head is both intermediate and variable, sometimes on the individual plant. The lowest two sterile bracts are short, rarely exceeding 5 mm. long, and vary from relaxed to appressed, sometimes on the same plant. The lateral sepals vary in length from 6 to 8 mm.; the anthers are also variable in length and shape.

The following specimens are considered to represent intermediate forms: Red Rock to Corindi, Constable 5.1964 (64429); Putty road, 69 miles S of Singleton, Constable 7.1963 (64617); Bilpin to Bowen's Creek road, Constable 7.1964 (64684); 2 miles S of Bodington Homes, King's Tableland, Wentworth Falls, Constable 1.1964 (64015); near Queen Victoria Hospital, King's Tableland, Wentworth Falls, Constable 2.1965 (73618); Linden, Constable 4.1963 (63120), 10.1963 (67129); Linden, Evans 12.1963 (69269); Cowan to Jerusalem Bay, Evans 12.1963 (64313); Cowan, Ku-ring-gai Chase, Evans 12.1963 (64312), 5.1964 (68720, 68721, 68722); West Head road, Ku-ring-gai Chase, Evans 12.1956 (SYD), 12.1963 (66790, 66921); old Bobbin

Head road, Ku-ring-gai Chase, Evans 5.1964 (64407); beside fire-trail, Mona Vale road to Cowan Creek, Evans 5.1964 (64410); Wahroonga, Cambage 12.1913 (SYD); Narrabeen, Fraser & Vickery 12.1933 (SYD); Cheltenham, Johnson 11.1946 (15591); Killara, Rainbow 12.1928 (18330); Oxford Falls road, Constable 4.1963 (63229); Castle Cove, McKee 5.1942 (SYD); Oatley, Camfield 12.1896 (18345).

Some of the intermediate forms have been found under drier conditions than ssp. *gracilis*, in this respect resembling ssp. *laxa*.

Records of *X. gracilis* from Tasmania apply to *X. muelleri* Malme and to an undescribed species. For discussion see Evans in Contrib. N.S.W. Nat. Herb. IV (1966) 6–7. Records from Queensland probably apply to *X. juncea* R. Br., which was included as a synonym of *X. gracilis* by Bentham and by Bailey; nevertheless *X. gracilis* ssp. *gracilis* may well occur in southern Queensland.

4. **X. complanata** *R. Br.*, Prodr. (1810) 256; Kunth, Enum. Pl. IV (1843) 20; Benth., Fl. Austral. VII (1878) 77; F. M. Bail., Synops. Qld. Fl. (1883) 554; Nilss. in K. Svensk Vet.-Akad. Handl. n.s. XXIV, No. 14 (1891) 29; Moore & Betche, Handb. Fl. N.S.W. (1893) 437; Rendle in Journ. Bot. XXXVII (1899) 500; F. M. Bail., Qld. Fl. V (1902) 1648; F. M. Bail., Compr. Catal. Qld. Pl. (1909) 561, fig. 544; Maiden & Betche, Census N.S.W. Pl. (1916) 38; Ewart & Davies, Fl. N. Terr. (1917) 66; Malme in Svensk Bot. Tidskr. XXI (1927) 381–389; Malme in Bull. Jard. Bot. Buitenzorg III, (1929) 387; Gardner, Enum. Pl. Austral. Occid. (1930) 17; van Royen in Fl. Males. ser. I, 4, IV (1954) 369. Perennial. Leaves flat. linear, acuminate, acute, 5–30 cm. long, 1–3 (–4) mm. wide, striate when dry, with whitish siliceous margins which are often scabridulous; sheathing bases 3–7 cm. long, pale to dark brown or sometimes reddish, the margins membranous. Scapes 20–60 cm. long, 1–2·5 mm. wide, distinctly compressed, striate, with strong scabrous marginal ribs and sometimes 1 or 2 additional ones, often twisted. Flower-heads oblong-ovoid, often becoming elongated and cylindrical later, 1–2·5 cm. long, 0·7–1 cm. wide. Lowest pair of barren bracts oblong to ovate, ca. 3 mm. long, the other barren bracts few, elliptic; median fertile bracts elliptic to orbicular, concave, entire,, slightly fringed or lacerate, sometimes greenish light brown, darkened with age-the margins scarcely darker. Lateral sepals with a distinct keel and broad membranous margins, the apex obtuse, ciliolate or denticulate. Corolla lobes small ca. 3 mm. long when dry. Stamens: anthers 1–1·5 mm. long when dry, as broad as long, each cell with 2 acute tips; filaments ca. 1 mm. long. Style cleft in the upper part into 3 short, broad branches. Ovary 1-locular, obovoid, obtusely 3-angled, the apex obtuse but crowned with the thickened base of the style; placentas parietal. Capsule 1-locular, obovoid to almost globular, 3–4 mm. long, the apex rounded but surmounted with a remnant of the thickened base of the style; dehiscence loculicidal; placentas adhering to the walls for their full length. Seeds ellipsoid, striate, reddish, small and numerous, ca. 0·4 mm. long. Chromosome number: $2n = 52$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). Fl. Summer. *X scabra* R. Br., Prodr. (1810) 256; *X. laevis* R. Br., loc. cit. *X. elongata* Rudge in Trans. Linn. Soc. X (1811) 289; F. Muell., Fragm. Phytogr. Austral. VIII (1874) 205; Domin in Bibl. Bot. XX (1915) 506. *X. walkeri* Wight ex Kunth, Enum. Pl. IV (1843) 19; Miquel. Fl. Ind. Bat., Suppl. (1861) 608. *X. malaccensis* Steud., Syn. Pl. Glum. II (1855) 287.

North and Central Coast, North- and Central-Western Slopes, in damp sandy soils. Round Mountain, Murwillumbah district, Teacher of Public School 2.1949 (18319); Ballina, Bäuerlen 1.1892 (18321); Casino, McAuliffe 12.1916 (18322); Evans Head, Rickards 12.1962 (50957); Wellingrove to Emmaville, Jessup & Gray 3.1954 (41942); Warialda, Rupp 5.1905 (18320); 1 mile W of Angourie, Green & Williams 11.1962 (NE); 1 mile from Corindi, on Red Rock road, Constable 5.1964 (64661); Hat Head, Kempsey district, Constable 1.1953 (22095); E of Ulan on Wollar road, Constable 1.1964 (64022); Munghorn Gap, 21 miles NE of Mudgee, Ingram 4.1952 (63287); 1 mile S of Howe's Valley P.O., Constable 4.1963 (63238); Howe's Valley, Constable 7.1963 (64355), 5.1964 (64571); Stoney Creek, 51 miles N of Windsor on

Singleton road, Constable 7.1963 (68252); Tinda Creek ca. 46 miles N of Windsor, Constable 7.1963 (64020); 1 mile N of Gibba Swamp, 44 miles N of Windsor, Constable 5.1964 (64572); Gibba Swamp, 44 miles N of Windsor, Constable 5.1964 (69635); W of Putty road, ca. 2 miles N of Grassy Hill, Rodd 2.1965 (73950); Richmond district, Evans 12.1963 (66932); Yarramundi, Constable 1.1964 (64021); Agnes Banks to Castlereagh, Constable 1.1964 (64018, 64019); near Narrabeen Lake, Salasoo 1.1953 (23614); Port Jackson, Brown 1802–5 (66340); Kurnell, Botany Bay, Constable 5.1964 (64406). Also in Queensland, Northern Territory and extending to Malesia and South East Asia.

No material has been seen of *X. complanata* var. *bracteata* Benth., loc. cit., or of var. ? *leptocaulis* Benth., loc. cit., and these varieties have not been mentioned by later authors except F. M. Bailey, loc. cit. Consequently their taxonomic position remains uncertain.

The name *X. anceps* Lam., Illustr. Gen. I (1791) 132, has been misapplied to this species by Vahl and other authors; see Nilsson in K. Svensk Vet.-Akad. Handl. n.s. XXIV (1892) 38.

5. **X. juncea** *R. Br.*, Prodr. (1810) 256; Rendle in Journ. Bot. XXXVII (1899) 500; Maiden & Betche, Census N.S.W. Pl. (1916) 38; Malme in Svensk Bot. Tidskr. XXI (1927) 381–390; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963) 432. Perennial. Leaves 2–12 cm. long, up to 1 mm. wide, subterete to linear, obtuse, glabrous, smooth when fresh, often finely striate when dry, sometimes twisted when long or curved when short; sheathing bases 1–3 cm. long, light brown to yellowish or reddish. Scapes 7–30 cm. long, 0·3–1 mm. diam., filiform, terete or obtusely angular, straight or twisted. Flower-heads globose to obovoid, 4–8 mm. long, 4–8 mm. diam. Basal pair of barren bracts oblong, erect or spreading, 4–6 mm. long, the remaining barren bracts very few, ellipsoid; median floral bracts orbicular to obovate, concave, 4–6 mm. long, the margins entire or minutely ciliolate, the exposed portions uniformly dull dark brown, the overlapped portions paler and becoming membranous. Lateral sepals ca. 4 mm. long with a dark brown keel and wide membranous margins, the apex obtuse and more or less ciliolate. Corolla lobes 3–5 mm. long when dry. Stamens: anthers ca. 1 mm. long; filaments slightly longer. Style cleft into 3 short broad branches. Ovary 1-locular; placentation parietal. Capsule obovoid, 2–3 mm. long, crowned with the persistent base of the style, 1-locular, dehiscing loculicidally from base to apex; placentas extending the full length of the walls. Seeds numerous, oblong-ellipsoid to ovoid, striate, brown, 0·4–0·5 mm. long. Chromosome number: $2n = 26$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). Fl. Summer. *X. juncea* var. *tenuior* R. Br. ex Rendle, loc. cit.

Coast and eastern part of the Central Tablelands, in swampy or damp sandy ground in open heath. Byron Bay, Rodway 9.1917 (58321); Wardell, Bäuerlen 12.1893 (18349); Evans Head, Green & Williams 11.1963 (NE); 1 mile NW of Angourie, Green & Williams 10.1962 (NE); Corindi to Red Rock road, 20 miles N of Coff's Harbour, Constable 10.1961 (58959); Red Rock, Green & Williams 10.1962 (NE); Bombah Point, Myall Lakes, Constable 1.1952 (19070), 7.1963 (64026); 2 miles SW of Lemon Tree Passage, Port Stephens, Johnson 4.1964 (64421); near Grassy Hill on Putty Road, Constable 7.1963 (64024); Kariong, Constable 1.1963 (64023); Mt. Charles, SE of Bell, Constable 4.1963 (63241); N side of Aerodrome, Blackheath, Constable 2.1963 (59155); Berambing Ridge, Bilpin, Ingram 1.1958 (66049); Bowen's Creek road, Bilpin, Constable 4.1963 (63236), 2.1964 (64367); Linden, Constable 4.1963 (63121); Bondi, Deane 12.1884 (18347); near Bondi, Betche 11.1888 (18350); near Long Bay Gaol, Evans 11.1932 (SYD); Como, Camfield 1.1898 (18351); N of Waterfall Sanatorium, Constable 7.1963 (66913); near Junction of Darke's Forest road and Prince's Highway, Constable 7.1963 (66914), 2.1964 (64365); Currarong, Jervis Bay, Briggs 12.1963 (67511); Table Mountain, Milton, Cambage 12.1913 (18348); Table Mountain, Milton, Constable 1.1963 (63139). Also in southern Queensland and eastern Victoria.

This species was wrongly treated as a synonym of *X. gracilis* R. Br. by Bentham, Fl. Austral. VII (1887) 79, and by F. M. Bailey, Qld. Fl. V (1902) 1649.

# 28. ERIOCAULACEAE

(By O. D. Evans)

Flowers unisexual or rarely hermaphrodite (in one extra-Australian genus), small and inconspicuous, 2- to 3-merous, actinomorphic or rarely zygomorphic, densely crowded in heads, each flower subtended by a bract, male and female often mixed, or male in the middle and female surrounding them, rarely male and female in separate heads, the whole surrounded by 1 or more rows of involucral bracts. Perianth scarious or membranous (rarely absent in female flowers), normally of 6 or 4 tepals in 2 whorls, the outer free or more or less connate, the inner often tubular, rarely absent, and inserted immediately below the stamens or carpels. Stamens as many as the inner tepals and opposite them, or twice the number or rarely 1 only; anthers 1- to 2-locular; filaments free from each other. Ovary superior, 2- to 3-lobed, 2- to 3-locular with 1 pendulous ovule in each loculus; style single with 2–3 simple or bifid filamentous stigmatic branches. Fruit a membranous capsule, 2- to 3-locular, opening loculicidally. Seeds solitary in each loculus, globular, ellipsoid or ovoid, striate or minutely tuberculate, with a copious mealy endosperm and a minute apical embryo.

Annual or perennial, monoecious or rarely dioecious, usually tufted, frequently scapigerous herbs, sometimes woody at the base. Roots fibrous. Leaves narrow, usually crowded, but sometimes cauline. Scapes or peduncles slender, simple or sometimes branched, usually longer than the leaves.

A family of 12 genera and about 1100 species. Plants of no known economic importance, mainly found in swampy places, tropical or subtropical with a few in temperate regions (especially well represented in tropical America). Principal genera *Eriocaulon* and *Paepalanthus*, only the former in Australia.

## ERIOCAULON L.

Annual or perennial, usually scapigerous herbs. Leaves linear to lanceolate, basal and tufted or, rarely, crowded on an elongated stem. Scape slender, erect, usually longer than the leaves. Inner tepals each with a minute dark gland near the apex (perianth absent in female flowers of *E. australasicum*); stamens twice the number of the inner tepals (except sometimes in *E. australe*); anthers 2-locular, often black.

A genus of about 200 species, widespread but principally in tropical and subtropical regions, mostly in marshy or aquatic conditions. It is most abundant in America and least in Europe where there is only one species. There are about 20 Australian species of which 4 extend to tropical Asia, the remainder being endemic. Four species are known in New South Wales, or on its immediate borders.

According to most authors, e.g. Ruhland (in Engler, Pflanzenr. IV, 30 (1903) 30), Hutchinson (Families of Flowering Plants ed. 2, II (1959) 576), Moldenke, (Résumé of the Verbenaceae, Avicenniaceae, Stilbeaceae, Symphoremaceae and Eriocaulaceae (1959) 399), *Eriocaulon* has the stamens twice as many as the inner tepals, and the tepals are free in the flowers of both sexes, these characters being used in the keys to distinguish it from some other genera. However, there are exceptions in both of these characters among our species, which have nevertheless not been removed from *Eriocaulon* by any recent author. The matter needs attention by a world monographer.

1. Outer bracts almost lanceolate, obtuse to acute; inner (fertile) bracts narrow, acuminate. Female flowers without tepals ........................ *E. australasicum* 1.

1.* Bracts not as above. All flowers with 2 whorls of tepals.

  2. Scapes 30–60 cm. long. Leaves 20–50 cm. long, up to 8 mm. wide with a few loose hairs towards the base .......................... *E. australe* 2.

  2.* Scapes less than 30 cm. long; leaves less than 10 cm. long. Heads not exceeding 6 mm. diam.

    3. Inner (fertile) bracts hoary at the apex with minute hairs. Flowers numerous in the head; tepals all free .................. *E. scariosum* 3.

    3.* Inner bracts glabrous, membranous. Flowers not numerous in the head; inner whorl of tepals in male flowers fused into an obconical tube which is conspicuously longer than the lobes .......... *E. carsonii* 4.

**1. E. australasicum** (*F. Muell.*) *Körn.* in Linnaea XXVII (1856) 616; Ruhland in Engler, Pflanzenr. IV, 30 (1903) 114; Maiden & Betche, Census N.S.W. Pl. (1916) 38; Ewart, Fl. Vic. (1931) 263; J. H. Willis, Handb. Pl. Vic. (1962) 281. Small annual scapigerous herb. Leaves 2–5 cm. long, ca. 1·5 mm. broad, linear-subulate, pellucid, fenestrate, 3- to 5-nerved. Scapes about as long as the leaves, erect, 4- to 5-ribbed. Flower-heads ovate to subglobose, 3–4 mm. diam.; outer bracts almost lanceolate, obtuse to acute, glabrous; inner bracts narrow, acuminate, glabrous; receptacle conical. Male flowers central, pedicellate; 3 outer tepals cohering at the base; 3 inner tepals fused into a tube, with 3 lobes at the apex each bearing a gland; stamens 6. Female flowers on short pedicels; perianth absent; style short with 3 filiform stigmatic branches. Capsule smooth, 3-locular; seeds solitary, smooth; *Electrosperma australasicum* F. Muell. in Trans. Phil. Soc. Vic. I (1855) 24. *Eriocaulon electrospermum* F. Muell.. Syst. Census Austral. Pl. (1882) 123, nom. illegit.- Moore & Betche, Handb. Fl. N.S.W. (1893) 440.

In wet ground along the Murray R. towards the junction with the Murrumbidgee, Mueller 12.1853 (NSW 58361, part of the HOLOTYPE). Known only from the type locality; if not extinct, it would be expected to occur on both the New South Wales (South-western Plains) and Victorian sides of the Murray River. Search for it is desirable.

**2. E. australe** *R. Br.*, Prodr. (1810) 254; Kunth, Enum. Pl. III (1841) 569; Benth., Fl. Austral. VII (1878) 192; F. Muell., Syst. Census Austral. Pl. (1882) 123; F. M. Bail., Syn. Qld. Fl. (1883) 578; Moore & Betche, Handb. Fl. N.S.W. (1893) 440; F. M. Bail., Qld. Fl. VI (1902) 1715; Ruhland in Engler, Pflanzenr. IV, 30 (1903) 66; Domin in Bibl. Bot. XX (1915) 506; Maiden & Betche, Census N.S.W. Pl. (1916) 38. Annual scapigerous herb sprinkled with loose hairs at least on the lower parts of the leaves and scapes. Leaves basal, tufted, linear, up to 60 cm. long and 0·8 cm. wide. Scapes about half as long again as the leaves, ribbed when dry with 6–7 distinct ribs. Flower-heads hoary, semi-globose, changing to depressed-globose at maturity, up to 8 mm. wide; involucral bracts closely imbricate, broad, glabrous or nearly so, the margins entire or lacerate; fertile bracts closely imbricate, 3 mm. long, up to 3 mm. wide, obconical, narrowed at the base into a short stalk, broad and rounded at the apex which is covered externally with a very short and dense, white, persistent tomentum. Flowers very numerous, the male and female mixed together or sometimes one sex or the other predominating, the tepals scarious or hyaline. Male flowers: outer tepals 3, irregular, the 2 laterals ca. 2·5 mm. long, 0·5 mm. wide, the middle one linear, much narrower; inner tepals 3, equal, less than 1 mm. long, inserted on the receptacle close beneath the stamens, each fringed with a few white hairs. Stamens 3–6 on very short filaments. Female flowers: parts seen better in fruiting stage as follows: outer tepals 3, irregular, the 2 laterals ca. 3 mm. long, up to 3 mm. wide, complicate, the keel very broadly winged, lacerate on the upper margin, the middle one lanceolate, concave, shorter than the laterals; inner tepals 3, regular, ca. 2·5 mm. long, linear but with a broader base. Ovary 3-lobed, 3-locular; style branches 3, filiform. Capsule similar to the ovary, slightly enlarged, opening by longitudinal slits. Seeds ellipsoid, ca. 0·8 mm. long, brown, shining. Fl. Summer and possibly most of the year.

North Coast, in wet places in sandy heathland and on margins of swamps. Cape Byron (58391); Byron Bay, Maiden & Boorman 11.1903 (58392); South West Rocks, Macleay R., Ingram 8.1941 (63340); Hat Head, Constable 1.1953 (22205); Hat Head, Ingram 1.1961 (63344). Also in Queensland and Northern Territory.

3. **E. scariosum** *Sm.* in Rees, Cyclop. XIII (1809), non R. Br. (1810); Britten in Journ. Bot. XXXVIII (1900) 483; Ruhland in Engler, Pflanzenr. IV, 30 (1903) 66; Domin in Bibl. Bot. XX, (1915) 507; Maiden & Betche, Census N.S.W. Pl. (1916) 38; J. H. Willis, Handb. Pl. Vic. (1962) 281; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963) 483. Annual scapigerous herb. Leaves radical, tufted, linear to narrow-lanceolate, tapered very gradually to an acute apex, 1·5–8 cm. long, 1·5 mm. wide. Scapes 3–30 cm. long, ribbed when dry with about 5 distinct ribs, glabrous or nearly so. Flower-heads hoary with short white hairs, hemispherical but soon becoming globose, 4–6 mm. diam.; outer bracts glabrous, scarious, concave, obovate, ca. 3 mm. long, with rounded apices, soon almost concealed on older heads; fertile bracts greyish, concave, obovate to spathulate, with rounded or shortly acuminate apices, narrowed at the base into a short stalk, up to 2 mm. long, glabrous on the inner surface, sprinkled with short white hairs on the exposed portion, the margins entire or denticulate. Flowers numerous, male and female mixed together or sometimes one sex or the other predominating. Male flowers stipitate; outer tepals 3, irregular, sometimes connate at the margins, the 2 laterals oblong-spathulate, contracted at the base, ca. 1 mm. long, 0·5 mm. wide, dark coloured, sprinkled on the dorsal surface with short whitish hairs near the apex, the middle one linear; inner tepals 3, minute, hairy, erect, appressed closely to the stamens, each with a minute black gland near the apex. Stamens 6; anthers black. Female flowers: outer tepals 3, irregular, the 2 laterals oblong-spathulate, up to 1·9 mm. long, incurved, dark coloured, with ciliate margins and sprinkled on the dorsal surface with short white hairs, the middle one linear or absent; inner tepals 3, equal, inserted higher up on the slender receptacle, narrowly oblong-spathulate, erect, white, covered on both surfaces with dense white hairs all lying in one direction, each tepal with a minute black gland at the apex. Ovary 3-lobed, 3-locular, sessile; style branches 3, filiform. Capsule similar to the ovary but slightly enlarged, each lobe opening loculicidally with a longitudinal slit. Seeds ellipsoid, ca. 0·5 mm. long, light brown, covered with minute, hoary, hair-like protuberances in a reticulate pattern. Fl. Summer. Fr. Summer and Autumn. Chromosome number: $2n = 64$ (Briggs in Contrib. N.S.W. Nat. Herb. IV (1966) 26). *E. smithii* R. Br., Prodr. (1810) 254 nom. illegit.; Kunth, Enum. Pl. III (1841) 569; Steud., Syn. Pl. Cyp. II (1855) 270; Körn. in Linnaea XXVII (1856) 653; Benth., Fl. Austral. VII (1878) 192; F. Muell., Syst. Census Austral. Pl. (1882) 123; F. M. Bail., Syn. Qld. Fl. (1883) 578; Moore & Betche, Handb. Fl. N.S.W. (1893) 440; F. M. Bail., Qld. Fl. VI (1902) 1715. *E. lhotzyki* Steud., Syn. Pl. Cyp. II (1885) 270. *Busseuillia novaehollandiae* Less. in Bougainville, Journ. Navig. II (1837) 348–351, t. 46; and see van Steenis in Bull. Bot. Gard. Buitenzorg, ser. III, 18 (1950) 460–461.

Coast, Tablelands and Central Western Slopes. In wet ground at margins of ponds and lagoons, in bogs and swampy places and along the sides of roadside drains, usually on sandy soils. Tenterfield to Sandy Flat, Maiden 12.1908 (58367); Woodburn, Bäuerlen 12.1894 (58368); Angourie, S of Yamba, Davis 1.1950 (52578); 10 miles NW of Grafton, O'Grady 1960 (58369); Armidale, Davis 12.1954 (58370); Hat Head, Korogoro Pt., NE of Kempsey, Constable 1.1953 (22204); Bulahdelah, Garden 10.1951 (17743); Raymond Terrace, Betche 1.1883 (58371);

Uarbry via Gulgong, Ingram 3.1952 (66343); Uarbry to Gulgong road, Constable 1.1964 (64030); Wollar to Ulan road, Constable 1.1964 (64031); Running Stream, Ilford to Capertee, Constable 7.1963 (66136); near Currant Mountain Gap, 13 miles E of Rylstone, McKee 1.1953 (58372); Jenolan Caves district, Blakely 4.1900 (58381); Stoney Creek, Windsor to Singleton road, Constable 7.1963 (64029); Colo Swamp, 6 miles S of Howe's Valley, Constable 7.1963 (64028); Rickaby's Creek, Londonderry, Constable 1.1964 (64027); Blacktown to Windsor road, Evans 5.1960 (63147); Watson's Bay, Sydney, Deane 12.1884 (58373); Centennial Park, Forsyth 12.1896 (58374); Centennial Park, Cheel 11.1898 (58375); Centennial Park, Johnson & Constable 8.1953 (26368); Coogee, Deane 12.1884 (58376); Maroubra Bay, Camfield 2.1899 (58377); Canterbury, Froggatt 12.1893 (58378); Kogarah, Camfield 10.1893 (58379); Shipwright's Bay, George's R., Camfield 12.1894 (58380); Picton Lakes road, Thirlmere, McBarron 4.1962 (57095); Wingello State Forest, Constable 1.1956 (36567); Nowra, Rodway 1.1934 (52580); Falls Creek, Nowra district, Rodway 4.1925 (52581); Parma Creek, SW of Nowra, Rodway 7.1935 (52579); between 5 Crossings and Mt. Coree, Gray 2.1961 (58382); Braidwood, Bäuerlen 12.1884 (58383); Big Badja, NE of Nimmitabel, Mueller 1953 (58384); also in Queensland and Victoria.

Although the type locality of *E. Lhotzkyi* is given by Steudel as Brazil, the type specimen has been examined by Dr. H. Moldenke (pers. comm.) who states that it belongs to *E. scariosum* Sm. and that the sheet is plainly marked " N. Holl.". Since Lhotzky collected in both Brazil and Australia, it appears that some confusion in labelling occurred.

**4. E. carsonii** *F. Muell.*, Proc. Linn. Soc. N.S.W., V (1890) 250, and in Bot. Centralblatt. XLIV (1890) 302 (in both cases as " *carsoni* "); Moore & Betche, Handb. Fl. N.S.W. (1893) 440; Ruhland in Engler, Pflanzenr. IV, 30 (1903) 98; Maiden & Betche, Census N.S.W. Pl. (1916) 38. Small, glabrous, scapigerous herb, possibly perennial. Leaves basal, tufted, lanceolate, gradually narrowed upward to an obtuse, often incurved apex, up to 6 cm. long and 0·5 cm. wide, the base enlarged and sheathing. Scapes rather robust, twice as long as the leaves or somewhat longer, angular. Flower-heads globose, up to 5 mm. diam. Involucral bracts ovate, obtuse, rounded, glabrous; fertile bracts obovate, obtuse, membranous, glabrous; central axis (receptacle) narrow-conical, up to 4 mm. long. Flowers scarcely numerous. Male flowers: outer tepals 3, spathulate- or linear-cuneate, somewhat lacerated at the apex; basal parts of the inner tepals fused into an obconical tube conspicuously longer than the lobes which are slightly fringed and each marked by a dark glandular spot. Stamens mostly 6; anthers rounded and almost black. Female flowers: outer tepals often 2 only, broad, cymbiform-conduplicate, whitish, opaque; innter tepals 3, ovate- to narrow-lanceolate, apiculate, brownish upward. Style short; stigmatic branches 3, filamentous. Fruit a membranous, turgid capsule, 3-valved. Seeds ellipsoid, shining, almost smooth, brown, ca. 0·6 mm. long. *E. submersum* Tate in Trans. Roy. Soc. S. Austral. XXIII (1899) 291, nom. illegit., non *E. submersum* Welw. ex Rendle (1899), nom. illegit.; Black, Fl. S. Austral., ed. 1, I (1922) 103; *E. tatei* Ruhl. in Engler, Pflanzenr. IV, 30 (1903) 117; Black, Fl. S. Austral., ed. 2, I (1943) 179 (incorrectly given as " nom. nov.").

Western Plains. Forming ample tufts in wet ground adjoining a somewhat saline spring, called by the aborigines Wee Watta spring, on Kallara Station, Darling R., near Louth, Carson 3.1888 (NSW 66346, Isotype). Also in South Australia where it is reported to have formed dense mats in a bog at springs between Lakes Blanche and Frome.

In New South Wales it is known only from the Type locality. Search is desirable at appropriate sites in the far west for further occurrence of this species. Recent endeavours to find it have been unsuccessful.

The original description of *E. submersum* Tate is incorrect in several respects. It stated that the female flower is tetramerous, with 2 sepals, 4 petals and a 2-branched style, also that the glabrous flower-heads and the form of the bracts distinguished it from all other Australian species. Tate noticed, however, that the fourth " petal " was distinct from the others. Careful examination of the type shows that it agrees with the description above under *E. carsonii.*

93 Crassulaceae
94 Escalloniaceae
95 Pittosporaceae
96 Cunoniaceae
97 Davidsoniaceae
98 Rosaceae
99 Mimosaceae
100 Caesalpiniaceae
101 *Papilionaceae, Part I*
102 Geraniaceae
103 Oxalidaceae
104 Linaceae
105 Erythroxylaceae
106 Zygophyllaceae
107 Rutaceae
108 Simaroubaceae
109 Burseraceae
110 Meliaceae
111 Tremandraceae
112 Polygalaceae
113 Euphorbiaceae
114 Callitrichaceae
115 Anacardiaceae
116 Aquifoliaceae
117 Celastraceae
118 Siphonodontaceae
119 Hippocrateaceae
120 Stackhousiaceae
121 Icacinaceae
122 Sapindaceae
123 Akaniaceae
124 Rhamnaceae
125 Vitaceae
126 Elaeocarpaceae
127 Tiliaceae
128 Malvaceae
129 Sterculiaceae
130 Dilleniaceae
131 Eucryphiaceae
132 Hypericaceae
133 Elatinaceae
134 Frankeniaceae
135 Violaceae
136 *Flacourtiaceae*
137 Passifloraceae
138 Cactaceae
139 Thymelaeaceae
140 Lythraceae
141 Rhizophoraceae
142 Myrtaceae
143 Melastomataceae
144 Onagraceae
145 Haloragiaceae
146 Araliaceae
147 Umbelliferae
148 Alangiaceae
149 Ericaceae
150 Epacridaceae
151 Myrsinaceae
152 Primulaceae
153 Plumbaginaceae
154 Sapotaceae
155 Ebenaceae
156 Symplocaceae
157 Oleaceae
158 Loganiaceae
159 Gentianaceae
160 Menyanthaceae
161 Apocynaceae
162 Asclepiadaceae
163 Convolvulaceae
164 Polemoniaceae
165 Hydrophyllaceae
166 Boraginaceae
167 Verbenaceae
168 Avicenniaceae
169 Labiatae
170 Solanaceae
171 Scrophulariaceae
172 Selaginaceae
173 Bignoniaceae
174 Pedaliaceae
175 Martyniaceae
176 Orobanchaceae
177 Gesneriaceae
178 Lentibulariaceae
179 Acanthaceae
180 Myoporaceae
181 Plantaginaceae
182 Rubiaceae
183 Caprifoliaceae
184 Dipsacaceae
185 Cucurbitaceae
186 Campanulaceae
187 Lobeliaceae
188 Goodeniaceae
189 Brunoniaceae
190 Stylidiaceae
191 Compositae

## PTERIDOPHYTA

192 Lycopodiaceae
193 Selaginellaceae
194 Isoetaceae
195 Psilotaceae
196 Ophioglossaceae
197 Marattiaceae
198 Osmundaceae
199 Schizaeaceae
200 Gleicheniaceae
201 *Hymenophyllaceae*
202 Cyatheaceae
203 Dicksoniaceae
204 Lindsaeaceae
205 Pteridaceae
206 Adiantaceae
207 Vittariaceae
208 *Davalliaceae*
209 *Grammitidaceae*
210 *Polypodiaceae*
211 *Aspidiaceae*
212 Thelypteridaceae
213 Aspleniaceae
214 Blechnaceae
215 Marsileaceae
216 Azollaceae
217 Salviniaceae